RESPONSE TO EPA COMMENTS DATED 17 JUNE 2014
DRAFT ADDENDUM #1 REMEDIAL DESIGN AND REMEDIAL ACTION WORK PLAN FOR OPERABLE UNIT 2, REVISED GROUNDWATER REMEDY, SITE ST012
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General Comments					
1				Section 3.0 describes the LNAPL scoring system used to determine the potential for each depth interval in each of the newly installed lower saturated zone (LSZ) wells to contain LNAPL. After reviewing a significant portion of the data, I propose a somewhat different approach to scoring the depth intervals of each LSZ boring for the potential presence of LNAPL: • First, if the soil analytical data for that interval shows fuel component concentrations that are indicative of LNAPL (see Feenstra et al., 1991), then LNAPL at residual saturations or greater, should be considered present. • Second, if a dye test within that interval was positive, then LNAPL at residual saturations or greater, should be considered present. • If there was neither a soil sample or dye test performed in an interval, then follow the scoring given in the first three bullets on page 3-1. Because this leaves three scores to consider for each	The LNAPL scoring system has been updated in the text with the following criteria: • "If there is a positive dye test within the interval, the interval is automatically scored as "Residual LNAPL Likely" • If the analytical results for Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX) or Naphthalene within the interval show concentrations indicative of LNAPL based on the methods in Feenstra et al, 1991, then that interval is automatically scored as "Residual LNAPL Likely" • If neither dye test kit results and analytical results indicate the presence of LNAPL or if data is unavailable, the following scoring is used to assess the presence of LNAPL: ▪ Staining (0 – 2): No stain received a score of 0. Notations of slight stain or stain received a score of 1. Notations of dark stain received a score of 2. ▪ Odor (0 – 2) No odor received a score of 0. Notations of slight odor or odor received a score of 1. Notations of strong odor received a score of 2. ▪ PID readings (0 – 2) PID readings below 45 parts per million by volume (ppmv) received a score of 0. PID readings from 45 to 449 ppmv

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				interval, rather than the original five, the total score needed for each of the categories (given in the three bullets starting at line 183) should be adjusted downward. Using the scoring outlined above, I noted several intervals where the category assigned to a certain interval would differ from that shown on Figures 3-1 to 3-7. This however is not an exhaustive list of intervals where different results would be obtained by using the scoring system proposed above, as not all intervals of all LSZ borings were re-evaluated based on the proposed scoring system. a. LSZ11, 160 – 170 feet below ground surface (bgs) interval, is shown in Figure 3-2 as having "No Indication of Potential LNAPL". However, the boring log shows that there was a positive dye test in this interval. The corresponding soil sample shows moderate concentrations of fuel components. This interval could be classified as "Possible Indication of Potential LNAPL" or "Indication of Potential Residual LNAPL". b. LSZ17, 160 – 170 feet bgs interval, is shown in Figure 3-2 as having "No Indication of Potential LNAPL". However, a soil sample obtained	received a score of 1. PID readings of 450 ppmv and above received a score of 2. ▪ Total petroleum hydrocarbon (TPH) results (0 – 2) (used for PDI wells only). TPH analytical results (the sum of Gasoline Range Organics and Diesel Range Organics results) below 25 milligrams per kilogram (mg/kg) received a score of 0. TPH analytical results from 25 to 249 mg/kg received a score of 1. TPH analytical results of 250 mg/kg and above received a score of 2. The individual scores in each category were carried down vertically until the next available data point. The scores for each parameter were then summed for each vertical interval in 1-ft increments. The summed value was used to identify the presence of residual LNAPL. The potential for residual LNAPL was divided into three categories based on the summed value: For PDI wells, which included TPH in the overall score: • 0 – 2: residual LNAPL unlikely • 3 – 5: potential residual LNAPL • ≥6: likely residual LNAPL For RA wells: • 0 – 2: residual LNAPL unlikely • 3 – 4: potential residual LNAPL • ≥5: likely residual LNAPL"

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				from a depth of 168 feet shows total petroleum hydrocarbon-gasoline range organics (TPH-GRO) of 11,000 milligrams per kilogram (mg/kg), and fuel constituent concentrations in the tens to hundreds of thousands of micrograms per kilogram(□g/kg), which is a clear indication of the presence of LNAPL (see Feenstra et al., 1991). c. LSZ18, 180 – 195 feet bgs interval, is shown in Figure 3-4 as having "Possible Indication of Potential LNAPL". However, the boring log shows that there were two positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater. d. LSZ18, 220 – 230 feet bgs interval, is shown in Figure 3-6 as having "Possible Indication of Potential LNAPL". However, a soil sample obtained from this interval shows fuel constituent concentrations that are indicative of LNAPL presence. Also, the boring log shows that there was a positive dye test in this interval. Both of these demonstrate that LNAPL is present at residual concentrations or greater. e. LSZ20, 220 – 230 feet bgs interval, is shown in Figure 3-6 as having "No Indication of Potential LNAPL".	All LSZ intervals have been reevaluated based on the updated scoring criteria. The specific locations noted have been revised as follows: a. LSZ11, 160 – 170 feet bgs: The Air Force agrees; the interval has been reclassified as "Possible Indication of Residual LNAPL". b. LSZ17, 160 – 170 feet bgs: The Air Force agrees; the interval has been reclassified as "Indication of Residual LNAPL". c. LSZ18, 180 – 195 feet bgs: The Air Force agrees; the interval has been reclassified as "Indication of Residual LNAPL". d. LSZ18, 220 – 230 feet bgs: The Air Force agrees; the interval has been reclassified as "Indication of Residual LNAPL". e. LSZ20, 220 – 230 feet bgs: A dye test was observed as "pink/red" in this interval, therefore the interval has been reclassified as "Indication of Residual LNAPL". f. LSZ21, 220 – 230 feet bgs: The PID reading at 220 – 221 ft bgs was measured at 73.4 ppmv, therefore the maximum total score for that interval is 2. The interval remains classified as "No Indication of LNAPL". g. LSZ21, 230 – 235 feet bgs: There was a positive dye test result, therefore the interval has been reclassified as "Indication of residual LNAPL". h. LSZ24, 170 – 180 feet bgs: The Air Force

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				However, the boring log at 225 feet bgs indicates the presence of black stains and strong odors, with PID reading of 219 and 121 ppm. According to the scoring system provided in the document, this interval should be classified as "Possible Indication of Potential LNAPL". f. LSZ21, 220 – 230 feet bgs, is shown in Figure 3-6 as having "No Indication of Potential LNAPL". However, the boring log shows that a slight fuel odor was detected at 220 feet bgs, and the PID reading at this depth was 734 ppmv. By the scoring criteria provided in the document, this interval should be categorized as "Possible Indication of Potential LNAPL." g. LSZ21, 230 – 235 feet bgs, is shown in Figure 3-7 as having "No Indication of Potential LNAPL". However, the boring log shows that a slight fuel odor was detected at 230 feet and 235 feet bgs, and that a faintly positive dye test result was found at 235 feet bgs. By the scoring criteria provided in the document, this interval should be categorized as "Possible Indication of Potential LNAPL." Thus, Figure 4-3 should also show this boring as having "Possible Indication of Potential	agrees; the interval has been reclassified as "Indication of residual LNAPL". i. LSZ32, 170 – 180 feet bgs: The Air Force agrees; the interval has been reclassified as "Indication of residual LNAPL".

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				LNAPL." h. LSZ24, 170 – 180 feet bgs interval, is shown in Figure 3-3 as having "Possible Indication of Potential LNAPL". However, the boring log shows that there was a positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater. i. LSZ32, 170 – 180 feet bgs interval, is shown in Figure 3-3 as having "Possible Indication of Potential LNAPL". However, the boring log shows that there was a positive dye tests in this interval, which demonstrates that LNAPL is present at residual concentrations or greater.	
2				2. Observation of Figures 4-1 to 4-3 shows that there are areas in each of the zones where significant LNAPL is likely present, but, with the proposed steam injection/extraction pattern, sufficient steam will not likely reach that area. These areas include: a. Cobble Zone – the area around CZ20 b. Upper Water Bearing Zone – the area of UWBZ21, UWBZ 23, UWBZ26, and UWBZ27 c. Lower Saturated Zone – southern perimeter I strongly recommend that the use of	All of these wells are planned to be extraction wells. Steam injection can be added relatively easily to these remediation wells during active SEE because it only requires a pipe connection between the steam header and the well. The Air Force understands the potential benefit of cyclic steam injection in these locations and will continue to assess specific locations for cyclic steam injection during operation based on the data presented in this addendum as well as data collected during SEE operation.

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				cyclic steam injection (as described in Section 3.3 of the Final Remedial Design and Remedial Action Work Plan) be considered for these areas in order to treat them with steam while minimizing the risk of spreading LNAPL outside of the treatment area.	
Specific Comments					
3	3-1	3rd bullet	168	The third bullet at the top of page 3-1 (starting on line 168) states that photoionization detector (PID) readings below 45 parts per million volume (ppmv) received a score of 0, readings from 45 to 449 ppmv received a score of 1, and readings above 450 ppmv received a score of 2. What is the basis for choosing the ranges that are given here?	The following was added to the end of the bullet: "These ranges were selected based on general observation of correlations between PID results and dye test kits or analytical data where both were available."
4	3-1	5th bullet	174	The fifth bullet at the top of page 3-1 (starting on line 174) states that TPH results below 25 mg/kg received a score of 0, while results from 25 to 249 mg/kg received a score of 1, and results greater than 250 mg/kg received a score of 2. Both gasoline range organics (TPH GRO) and diesel range organics (TPH DRO) were measured on soil samples obtained for analysis. Which TPH results were used for the scoring? What is the basis for choosing the ranges that are given here?	The bullet has been revised to read: "Total petroleum hydrocarbon (TPH) results (0 – 2) (used for PDI wells only due to available data density). TPH analytical results (the sum of Gasoline Range Organics and Diesel Range Organics results which represents JP-4) below 25 milligrams per kilogram (mg/kg) received a score of 0. TPH analytical results from 25 to 249 mg/kg received a score of 1. TPH analytical results of 250 mg/kg and above received a score of 2. These ranges were selected based on general observation of correlations between

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					TPH results and dye test kits where both were available."
5	3-1	5th bullet	174	The fifth bullet at the top of page 3-1 (starting on line 174) states that TPH results only from the pre-design investigation (PDI) wells was used in the scoring. Why were the TPH results for soil samples obtained from other LSZ wells not included in the scoring?	During the PDI, sampling occurred at regular depth intervals (about every 10 feet) which allowed for LNAPL interpretation in those wells based on TPH. For the wells installed during remedial action (LSZ18 through LSZ42) only one sample was taken and analyzed for TPH per well. The phrase "due to available data density" was added to the bullet (see response to specific comment 4).
6		Figures 3-1 to 3-7		The Legend for Figures 3-1 to 3-7 show that a red circle around a well indicates "Indication of Potential Residual LNAPL." This is misleading, given that many of the soil sample results clearly have fuel component concentrations that indicate the presence of fuel as an LNAPL when consideration is given to the criteria presented in Feenstra et al. (1991). I recommend that this label be changed to "Indication of LNAPL."	The legend for Figures 3-1 to 3-7 have been changed to the following: 1. Indication of Residual LNAPL 2. Possible Indication of Residual LNAPL 3. No Indication of LNAPL
7		Figures 4-1 to 4-3		On Figures 4-1 to 4-3, please provide larger symbols for the injection and extraction wells (similar to what was used on slides 10 and 15 from the March 25-26, 2014 BCT Meeting). This will make the 'pattern' of the injection and extraction wells in each of the zones easier to see.	Larger symbols for injection and extraction wells have been provided in Figures 4-1 through 4-3.